

What is claimed is:

1 1. An array of resilient solder bonding structures, each one
2 comprising a solder ball having a curved exterior surface enclosing a first
3 volume and having an interior cavity having a displacement constituting a
4 second volume, the solder ball connecting at least one metal contact on a first
5 surface to at least one metal contact on a second surface.

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1 2. The array of resilient solder bonding structures as claimed in
2 claim 1, wherein the second volume is not less than about 1% of the first
3 volume.

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1 3. The array of resilient solder bonding structures as claimed in
2 claim 1, wherein the second volume is not more than about 90% of the first
3 volume.

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1 4. A resilient ball grid array (BGA) electrical and mechanical
2 attachment means for attaching an integrated circuit to a planar substrate,
3 comprising a plurality of solder ball structures, each solder ball structure
4 having a curved exterior surface enclosing a first volume and having an
5 interior cavity having a displacement constituting a second volume, each
6 solder ball structure attaching one of a plurality of first metal contacts on the

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Solder
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Solder
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7 integrated circuit to an associated one of a plurality of second metal contacts
8 on the planar substrate.

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1 5. The resilient BGA attachment means as claimed in claim 1,
2 wherein the second volume is not less than about 1% of the first volume.

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1 6. The resilient BGA attachment means as claimed in claim 1,
2 wherein the second volume is not more than about 90% of the first volume.

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1 7. A resilient ball grid array (BGA) electrical and mechanical
2 attachment means for attaching an integrated circuit to a printed circuit board,
3 comprising a plurality of solder ball structures, each solder ball structure
4 having a curved exterior surface enclosing a first volume and having an
5 interior cavity having a displacement constituting a second volume, each
6 solder ball structure attaching one of a plurality of first metal contacts on the
7 integrated circuit to an associated one of a plurality of second metal contacts
8 on the printed circuit board.

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1 8. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 7, wherein a substrate of the printed
3 circuit board is made of organic materials.

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1 9. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 7, wherein a substrate of the printed
3 circuit board is made of inorganic materials.

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1 10. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 7, wherein the second volume is not
3 less than about 1% of the first volume

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1 11. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 7, wherein the second volume is not
3 more than about 90% of the first volume.

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1 12. A resilient ball grid array (BGA) electrical and mechanical
2 attachment means for attaching a first planar substrate to a second planar
3 substrate, comprising a plurality of solder ball structures, each solder ball
4 structure having a curved exterior surface enclosing a first volume and having
5 an interior cavity having a displacement constituting a second volume, each
6 solder ball structure attaching one of a plurality of first metal contacts on the
7 first planar substrate to an associated one of a plurality of second metal
8 contacts on the second planar substrate.

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1 13. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 12, wherein the first and second planar
3 substrates are first and second printed circuit boards, respectively.

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1 14. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 13, wherein the first and second
3 printed circuit boards are made of organic materials.

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1 15. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 13, wherein the first and second
3 printed circuit boards are made of inorganic materials.

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1 16. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 12, wherein the second volume is not
3 less than about 1% of the first volume.

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1 17. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 12, wherein the second volume is not
3 more than about 90% of the first volume.

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1 18. The resilient ball grid array (BGA) electrical and mechanical
2 attachment means as claimed in claim 12, wherein the first and second planar

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- 3 substrates are comprised of one or more materials from the group consisting
- 4 of plastic, ceramic, and epoxy-glass.

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